

EPA Superfund Explanation of Significant Differences:

LIBBY GROUND WATER CONTAMINATION

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EXPLANATION OF SIGNIFICANT DIFFERENCES

Libby Ground Water Superfund Site Lincoln County, Montana

United States Environmental Protection Agency
September 1993

I. INTRODUCTION

This Explanation of Significant Differences (ESD) is being issued by the U.S. Environmental Protection Agency (EPA) to present the remedial action determination for the Lower Aquifer at the Libby Ground Water Superfund Site (hereby referred to as "Libby" or the "Site") and identifies the documents that serve as the basis for the determination. This ESD also presents modifications to certain elements of the selected remedy documented within the Record of Decision (ROD) issued in December 1988 for the Site. As such, the ESD represents EPA's final decision concerning remediation at the Libby Site.

EPA, in consultation with the Montana Department of Health and Environmental Sciences (MDHES), and after consideration of documents prepared to address effects to human health and the environment from contaminants in the Lower Aquifer, has determined that continued restrictions on private water supply wells and long-term water quality monitoring shall constitute the remedy for the Lower Aquifer. Implementation of the selected remedy for the Lower Aquifer will begin immediately.

As described in the 1988 ROD, the remedial determination for the Lower Aquifer consisted of an interim remedy that required the Potentially Responsible Party (PRP), Champion International Corporation, to conduct additional studies regarding the feasibility and effectiveness of enhanced bioremediation activities in conjunction with oil recovery and oil dispersion techniques. At the time the ROD was signed, EPA stated that a final remedy would be documented within a separate ROD specific to the Lower Aquifer. The purpose of this ESD is to fulfill the objectives of the proposed Lower Aquifer ROD in a concise format as well as to document modifications to the soil cleanup levels for the Land Treatment Unit (LTU) described under the Soils and Source Area remedy (see 1988 ROD, pages 51-53).

The modifications to the remedy described in this ESD do not alter the selected remedy in any fundamental aspect regarding scope, cost, or performance. In accordance with Sections 117(c) and 121 of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (Superfund), as amended, 42 U.S.C. Section 9601, *et seq.* ("CERCLA"), and the regulations at 40 C.F.R. Section 300.435(c)(2)(i), the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), this ESD has been prepared for the following reasons:

- to provide the public with an explanation of the nature of the changes to the remedy;
- to summarize the circumstances that led to the changes to the remedy; and
- to affirm that the revised remedy complies with all statutory requirements.



MDHES concurred on the ROD issued on December 30, 1988, and has participated in the review of information leading to this ESD, including documents prepared to characterize the Lower Aquifer, to evaluate potential risks to human health and the environment and to evaluate ground water treatment technologies.

This document presents only a summary of the changes to the selected remedy and a synopsis of information on the Site. The Administrative Record, which contains this ESD and the complete documentation, is available for public review at the locations indicated at the end of this report.

II. SITE HISTORY AND BACKGROUND

The Libby Groundwater Superfund Site is located in the northwestern corner of Montana adjacent to the City of Libby, Lincoln County (see Figure 1). The Site currently consists of a lumber and plywood mill and is owned and operated by Champion International Corporation (hereafter Champion). From 1946 to 1969, the Site was operated as a wood treatment facility. Wood treating fluids, such as creosote [composed almost entirely of polynuclear aromatic hydrocarbons (PAHs)] and pentachlorophenol (PCP) were known to have been disposed and spilled at several different locations at the facility during this time. Groundwater contamination was first noticed within a domestic well (located within city limits) in 1979. EPA began site investigations in 1980, and eventually placed the Site on the National Priorities List of Superfund Sites In 1983.

In 1985, studies were conducted to determine public exposure to contaminated groundwater in the City of Libby. As a result of these investigations, EPA recommended that an alternative water source be supplied to residents whose wells were contaminated by groundwater emanating from the facility. This recommendation was approved in a September 26, 1986 ROD and was implemented by Champion. Champion began additional remedial investigation studies in 1986 involving characterization of all contaminated media, including bench and pilot-scale testing of remedial technologies. In 1988, EPA and MDHES signed a ROD that selected final cleanup methods for the affected media, including the soils/source area and the Upper Aquifer and an interim remedy for the Lower Aquifer. A Consent Decree requiring Champion to perform these cleanup activities was entered in the Federal District Court of Montana in October 1989. A summary of the 1988 selected remedy is provided in Section III below.

Remedial design activities began shortly after the Consent Decree was issued. These design activities included the preparation of remedial design documents that outline the strategy and design components of the remedy selected for both the contaminated soils and the contaminated Upper Aquifer. Implementation and operation of the components to the selected remedy has provided invaluable information regarding the effectiveness of the respective components. In particular, operational data for the LTU has identified the need to draft this ESD to modify the established cleanup levels at the LTU. [Additional details of the role of the LTU within the selected remedy is provided in Section III.] These modifications are intended to expedite the selected remedy for the contaminated soils while maintaining the original degree of protectiveness to human health and the environment.

Champion has also completed their investigation regarding the potential effectiveness of a bioremediation remedy for the Lower Aquifer as mandated within the 1988 ROD. The findings of this study and the final remedy selection for the Lower Aquifer were to be documented within a separate ROD; however, EPA has chosen to publish this information within this ESD.

III. SUMMARY OF THE 1988 RECORD OF DECISION

The objective of the remedy selected in the 1988 ROD is to reduce human exposure to both the soil and groundwater contaminants of concern (see ROD, pages 51-55). The major components of this remedy consist of excavation and biological treatment of contaminated soils within an onsite LTU, and the *in situ* biological treatment of contaminated groundwater within the Upper Aquifer (including a pump and treat system for the heavily contaminated groundwater and oily product, with treatment occurring within a bioreactor system). An interim remedy was selected for the Lower Aquifer that consisted of feasibility testing of bioremediation remedial technologies, both alone and in conjunction with oil recovery and oil dispersion techniques (see ROD, page 55).

A complete list of the components to the current remedy selected for the Site can be found on pages 2 through 5 of the ROD. A brief summary of the existing remedy includes the following excerpts:

- Contaminated soils from the identified source areas will be excavated and placed within a waste pit, that already contains contaminated soils and debris from past disposal practices at the Site. These contaminated soils will undergo a two-step enhanced biodegradation process. The initial treatment phase will be conducted in the waste pit area, while the contaminants will be further degraded biologically after transfer to the LTU. The LTU, which will be both lined and capped with low permeability materials, will serve as a final disposition location.
- The property owner shall be required to insert language within the current registered deed identifying the locations of the hazardous substances disposal and treatment areas, and restrict the future land use of these areas. This deed restriction is considered part of the selected remedy for the soils/source area.
- A combination of *in situ* bioremediation treatment processes will be utilized to degrade organic contaminants in the saturated zone of the waste pit area. A closed loop, bacteria rich groundwater injection and extraction system will be employed in the waste pit area to remove and degrade contaminants adsorbed on soil matrices.
- The oil recovery wells will also be used to collect highly contaminated groundwater, which will undergo treatment in a fixed film bioreactor prior to reinjection through a rock percolation bed.
- An *in situ*, enhanced bioremediation program will be initiated in the Upper Aquifer to reduce contaminant concentrations to required risk and ARAR-based levels. This innovative treatment technology will address both the dissolved constituents in groundwater as well as adsorbed contaminants on the aquifer matrices concurrently.
- An interim remedy was selected for the Lower Aquifer which required the PRP to conduct a pilot test to determine if enhanced bioremediation of the aquifer, both alone and in conjunction with oil recovery and oil dispersion techniques, is an effective method of remediation.
- The city ordinance prohibiting drilling new water supply wells within city limits (both within the Upper and Lower Aquifers) will be continued.

- Monitoring activities required to assess the performance of the components of the remedy will be performed throughout the life of the remedial activities at the Site. Long-term monitoring of the Lower and Upper Aquifer water quality is also required to determine further movement of the respective contaminant plumes, ensure protection of public health and assess potential degradation of Kootenai River.
- The Site conditions will be reviewed no less often than each five years after initiation of remedial action to ensure that human health and the environment are being protected by the remedy.

IV. DESCRIPTION OF SIGNIFICANT DIFFERENCES TO THE REMEDY

The significant differences between the remedy described in the 1988 ROD and in this ESD are:

1. The 1988 ROD described how the final remedy selected for the Lower Aquifer would be documented within a separate ROD (see ROD, page 4). EPA has determined that based on the simplicity of the final remedy (described below), documentation of the selected remedy within this ESD will be sufficient.
2. Based on information described within the three Lower Aquifer reports submitted by Champion (Lower Aquifer Characterization Report, February 1993; Technology Evaluation Report for the Lower Aquifer, August 1993; Focused Risk Assessment Report for the Lower Aquifer, August 1993). EPA, in consultation with MDHES has determined that the final remedy for the Lower Aquifer shall consist of the continuance of both institutional controls prohibiting installation of new water supply wells (in both the Upper and Lower Aquifers) within the City of Libby and the long-term groundwater monitoring program initiated by Champion. Additional details and supporting rationale behind the selected remedy will be discussed below.
3. The limitations established in the 1988 ROD for pyrene, naphthalene and phenanthrene in soils will be removed. EPA cites the rationale provided by field data and the language provided within the No-Migration Petition as reasons behind removing these requirements. Further discussion is provided below.

Only those changes described in paragraphs 1, 2, and 3 above are being made to the selected remedy described in the 1988 ROD. All other aspects of the selected remedy documented in the 1988 ROD, as described above, remain the same. A more detailed description of the revised components to the remedy follows.

A Documentation of Lower Aquifer Final Remedy within an ESD

The 1988 ROD selected an interim remedy for the Lower Aquifer based on EPA's position that more studies were required to determine the feasibility of applying bioremediation techniques alone and in conjunction with oil recovery and oil dispersion techniques in the Lower Aquifer. These studies were to be conducted similar in scope to the earlier restoration pilot programs initiated for the Upper Aquifer. The ROD (Page 4) states "At the conclusion of the pilot program, a Record of Decision will be issued which will select a final remedy for the Lower Aquifer." Data and conclusions drawn from subsequent reports prepared by Champion has led EPA to determine that active remediation of the Lower Aquifer is infeasible, and to select a final remedy that does not involve active treatment of the Lower Aquifer (see description of the Lower Aquifer remedy below). Based on the brevity and simplicity of the remedy, EPA believes that documentation of the final remedy within this ESD will be sufficient.

B. Final Remedy for the Lower Aquifer

1988 ROD Interim Remedy. As described above, the 1988 ROD required Champion to conduct additional feasibility testing of *in situ* bioremediation techniques both alone and in conjunction with oil recovery/dispersion techniques. These studies were deemed necessary, due to the apparent inability of the remedial alternatives evaluated within the Feasibility Study to effectively reduce contaminant concentrations within a reasonable time frame. A final remedial measure was to be chosen by the regulatory agencies at the conclusion of these studies. In addition to the feasibility studies, institutional controls and continued monitoring were required to ensure protection of human health and the environment.

New Information Since the 1988 ROD. As part of the feasibility studies regarding the potential for bioremediation techniques to be effective at remediating the Lower Aquifer, Champion conducted bench-scale tests to evaluate the efficacy of *in situ* remedial techniques to mobilize and biodegrade dense non-aqueous phase liquids (DNAPLs). A description of test procedures and initial results are documented within Champion's Lower Aquifer Bench Test Interim Report, October 1990.

In addition to the bench test report described above, Champion conducted additional investigations regarding the characterization of the DNAPL distribution and Lower Aquifer hydrogeologic characteristics that effect the transport of DNAPLs. The results of these studies have been published in Champion's Lower Aquifer Characterization Report, February 1993. This report served as a basis for the *Focused Risk Assessment Report (August, 1993)* and the *Technology Evaluation Report (August, 1993)* for the Lower Aquifer. All three of these reports are available in the Administrative Record.

The reports listed above were reviewed and commented on by both the EPA and MDHES. A summary of the conclusions drawn from these reports is provided below:

- The dissolved contaminant plumes have apparently stabilized (e.g., have not migrated further downgradient in the past six to eight years), consequently there is no need for migration control of the dissolved phase plumes.
- A small potential for cross-contamination of the Upper Aquifer could exist in an area of the Lower Aquifer plume where a natural upward gradient appears to occur. The estimated upward flux does not result in contaminant concentrations that exceed EPA's maximum contaminant levels (MCLs) for drinking water in the Upper Aquifer.
- The potential for either the dissolved contaminant plume or the DNAPL plume to reach the Kootenai River is low. Even if such migration occurred, using conservative assumptions regarding contaminant release and mixing in the river, it was shown that estimated chemical concentrations in the river would be below MCLs and freshwater quality criteria by factors of 10 to 10,000,000.
- Direct ingestion and dermal contact of the dissolved contaminants found in the Lower Aquifer was shown to pose an unacceptable excess cancer risk based on EPA guidance. The total cancer risk estimates exceed EPA's target excess cancer risk range of 10^{-6} to 10^{-4} for Superfund sites. Therefore, even though there are currently no water supply wells drawing water from the Lower Aquifer, the No Action alternative alone is not an appropriate response action for the Lower Aquifer.
- Institutional controls (prohibiting installation of new water supply wells) are currently in place, effectively eliminating the only potential pathway of concern (e.g., ingestion of Lower Aquifer groundwater).

- Remediation of Lower Aquifer DNAPL contamination using technologies based on a pump and treat system or *in situ* bioremediation is considered technically impracticable. In addition, use of oil dispersion techniques (such as surfactants) could potentially result in greater risk to human health and the environment than currently exists or would exist in the future.
- A combination of institutional controls and Lower Aquifer monitoring can provide effective risk protection, as well as long-term protectiveness if the dissolved phase plume remains relatively stable as it has in the past.

Final Remedy For The Lower Aquifer. EPA and MDHES have reviewed the results of Champion's reports for the Lower Aquifer, and MDHES has provided EPA with its comments. Comments to these reports were also prepared by representatives of Jacobs Engineering Group, Inc. and the Robert S. Kerr Environmental Research Laboratories, who reviewed the reports on behalf of EPA. These review comments are available for review in the administrative record. In addition to information of the Site in general, contained in the Administrative Record, EPA has considered these reviews and comments in selecting the final remedy for the Lower Aquifer.

Based on the data and results obtained from Champion's reports, as well as a review of the available technologies, EPA and MDHES have concluded that remediation of the Lower Aquifer in a cost-effective and timely manner would be technical infeasible (with current technologies). In addition, the use of oil dispersion techniques, as suggested in the 1988 ROD, may potentially result in a greater risk to human health and the environment by allowing the contaminants to become more mobile and thus migrate further downgradient. At present, the groundwater quality data indicates that the plumes in both aquifers have been stabilized (see Champion's Lower Aquifer Characterization Report, February 1993). Given these conclusions, the selected final remedy, as it pertains to the Lower Aquifer, consists of the components listed below:

- The ordinance passed by the City of Libby, which prohibits the drilling and installation of new water supply wells within city limits, will remain in affect for the Lower Aquifer indefinitely, unless otherwise dismissed by EPA. [The ordinance, as it applies to the Upper Aquifer, will remain in effect until cleanup goals documented within the 1988 ROD are achieved and maintained.] This institutional control is designed to eliminate the primary potential exposure pathway identified by the EPA (e.g., ingestion of the Lower Aquifer groundwater). Thus, this remedy is considered protective of human health.
- The long-term groundwater monitoring program initiated by Champion for the Lower Aquifer will also be continued to determine movement of contaminant plumes, ensure protection of human health and, if plumes are shown to migrate in the future, assess potential damage to the Kootenai River. Results of the Lower Aquifer monitoring program will be submitted to EPA and MDHES annually. Modifications to the monitoring program will be assessed at the five-year review.
- In accordance with guidance provided in Section 121(c) of CERCLA, the selected remedy requires a review five years from implementation of remedial action to ensure protection of human health and the environment. For the Lower Aquifer, this review may consist of, but may not be limited to, a review of the Lower Aquifer monitoring data to assess plume migration and/or degradation, as well as a review of the technology advances in DNAPL remediation and their applicability to the Libby Site.

In accordance with Section 121 (d)(4)(B) and (C), EPA may waive ARAR requirements based on the evidence that compliance with such requirements will result in greater risk to human health and the environment than alternative options and/or is technically impracticable from an engineering perspective. Based on the conclusions and supporting rationale provided within Champion's Technology Evaluation Report, EPA hereby waives the following ARAR requirements for specific contaminants found within Lower Aquifer groundwater:

- Reduction of PCP concentrations below the primary MCL of 1 Fg/L;
- Reduction of naphthalene concentrations below EPA's lifetime health advisory limit of 20 Fg/L;
- Reduction of chrysene concentrations below the primary MCL of 0.2 Fg/L; and,
- Reduction of benzo(a)anthracene concentrations below the primary MCL of 0.1 Fg/L.

C. Modification to Remedial Goals Set for Contaminated Soils

EPA and MDHES established soil cleanup levels in the 1988 ROD that were based on both risk assessment results and proposed (Best Demonstrated Available Treatment) BDAT requirements for land disposal of the wastes found at the Site. These cleanup goals include:

<u>Contaminant(s)</u>	<u>Cleanup Goal</u>	<u>Source</u>
Total Carcinogenic PAHs	88 mg/kg	Libby Risk Assessment
Dioxin/Furan Equivalency	0.001 mg/kg	Libby Risk Assessment
Naphthalene	8.0 mg/kg	BDAT Requirements
Phenanthrene	8.0 mg/kg	BDAT Requirements
Pyrene	7.3 mg/kg	BDAT Requirements
Pentachlorophenol	37.0 mg/kg	BDAT Requirements

The cleanup goals listed above that are based on BDAT requirements were incorporated within the 1988 ROD due to the land disposal restrictions (LDRs) that applied to the remedy (land treatment units) proposed for the wastes found in soils at the Site. However, it was recognized by both Champion and EPA at the time of the ROD that achievement of the pyrene level by land treatment would likely prove most difficult because the BDAT limitations were based on incineration as the applicable treatment technology. Page 58 of the ROD states:

"The Hazardous and Solid Waste Act requires BDAT treatment of K001 sludge [such as wood preserving wastes found at the Site] prior to land disposal. Because land treatment is considered a form of land disposal, and because the contaminated soils are K001 soil and debris once mixed in the waste pit, these requirements are considered applicable to the placement of waste in the final treatment cell [e.g., the LTU]. It is unknown at this time whether land treatment at the Libby site will reduce concentrations of contaminants to below BDAT concentrations, so that the land disposal restrictions would eventually be met. However, because disposal placement will probably occur after August 8, 1990, a demonstration of no-migration petition will be prepared and submitted to EPA to allow continued use of the innovative biodegradation technology at the Libby site. This [acceptance of the proposed no-migration petition] will comply with the land disposal restrictions."

The final No-Migration Petition was reviewed by both EPA and MDHES and approved in September 1990. In summary, the study demonstrated that no adverse impact to human health or the environment would occur during operation of the LTU.

Although field data collected over the past four years of operating the LTU indicates that BDAT levels for pyrene can be achieved, the time required to remediate the soils to pyrene cleanup levels (7.3 mg/kg) is considerably longer than the time required to meet the other cleanup goals. Field data listed in Table 1 of Champion's April 2, 1993 letter to EPA (see Administrative Record) indicates that, on the average, as much as one third of the total time to remediate one soil lift within the LTU is required to achieve the pyrene BDAT. The data indicates that without the pyrene BDAT requirement, the time required to remediate all of the contaminated soils at the site can be reduced by as much as a third.

In addition to the potential savings in total remediation time for the contaminated soils, removing the BDAT requirement for pyrene will not compromise the overall protectiveness of the selected remedy. Pyrene is included in the list of total carcinogenic PAH compounds whose sum total concentration must be remediated below the risk-based cleanup goal of 88 mg/kg. By remediating the total carcinogenic PAHs below this goal, EPA has determined that the residual concentrations of carcinogenic PAHs (including pyrene) will be protective of human health and the environment.

Field data available in Champion's *LTU Annual Operations Reports* also indicate that BDAT requirements for both naphthalene and phenanthrene are achievable with the selected soils remedy. In fact, cleanup goals established for these compounds are achieved prior to those established for total carcinogenic PAHs or PCP. Thus, standards set for total carcinogenic PAHs and PCP would ultimately govern the total time required to fully remediate a soil lift within the LTU.

With a potential for expediting the time required to remediate the contaminated soils at the Site by as much as one third while still maintaining the degree of protectiveness for human health and the environment, and EPA's approval of the No-Migration Petition, EPA is removing the soil treatment levels for pyrene, naphthalene, and phenanthrene. As explained above, the degree of protectiveness for human health and the environment will be maintained by remediating the total carcinogenic PAH compounds down to the risk-based goal of 88 mg/kg. All other requirements for remediating the contaminated soils within the LTU (as listed above) will remain in effect.

V. SUMMARY OF STATE COMMENTS AND AVAILABILITY OF ADMINISTRATIVE RECORD

As stated above, MDHES has reviewed the documents that serve as the basis for this determination and has provided comments to EPA on the documents. All of the MDHES comments were incorporated into the final reports. MDHES has been provided with the opportunity to review and comment on this ESD. No written or verbal comments were received from MDHES.

Documents referenced within this ESD are part of the Administrative Record for the Libby Site. The administrative record will also contain any written public comments that may be received regarding this ESD. The complete administrative record for the Site is available for public review at the following location:

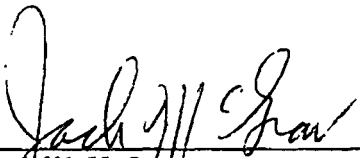
U.S. EPA Montana Office
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Lincoln County Annex
418 Mineral Avenue
Libby, Montana 59923
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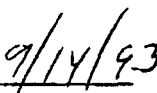
VI. AFFIRMATION OF STATUTORY REQUIREMENTS

Considering the new information that has been developed and the changes that have been made to the selected remedy, EPA, in consultation with MDHES, believes that the remedy remains protective of human health and the environment, complies with Federal and State requirements that are both applicable or relevant and appropriate to this remedial action or involves appropriate waivers of these requirements, and is cost-effective. In addition, the revised remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable for the Site.

VII. APPROVAL



Jack W. McGraw
Acting Regional Administrator



Date

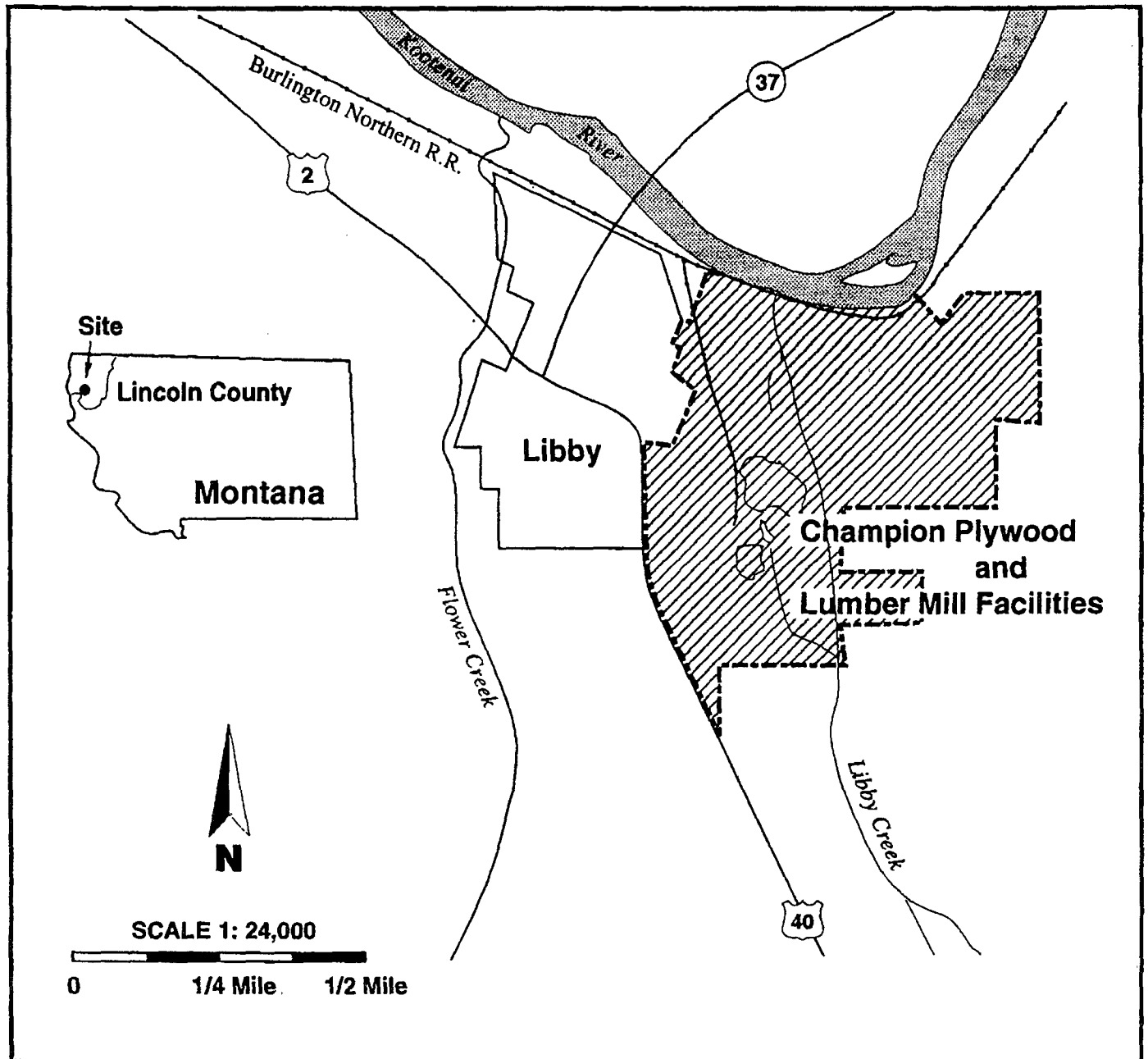


FIGURE 1
Champion International Mill Site
Libby, Montana